MIE334: Numerical Methods **Assignment 3**

Due: **March 25th**, **11:59 pm**, 2021

1. Use the least-square regression to fit a straight line to the following set of data. In addition to calculating the *slope* and *intercept* of the regression line, find the *standard error* and the *coefficient of determination* as well. Next, using MATLAB, plot the data points and the regression line in a **single** figure. For plotting data points use the `scatter` function. Write the details of your calculations and put your final answers in the designated areas in the answer sheet. Use the provided table in the answer sheet to organize your calculations and retain 4 digits after the decimal point. Next, if you measure an additional data point, **x = 10, y = 10**, and want to add it to the rest of the points, based on the plotted figure and the calculated standard error, do you think that the new data point is erroneous or valid? Briefly justify your conclusion.

x	6	7	11	15	17	21	23	29	29	37	39
y	29	21	29	14	21	15	7	7	13	0	3

2. The following table summarizes the recorded values of specific heat capacity (at constant pressure) of CO_2 as a function of temperature:

$T(K)$	300	350	400	450
$C_p(J/kg \cdot K)$	846.3	895.5	939.1	978.5

Estimate the specific heat capacity of CO_2 at a temperature of 380 K using the Newton's interpolating polynomials (with optimal accuracy). Use the provided table in the answer sheet to organize your calculations and carry 4 digits after the decimal point in your calculations.

3. Fit a 2nd order polynomial ($y(x) = a_0 + a_1 x + a_2 x^2$) to the following data:

x	3	4	5	7	8
y	1.6	3.6	4.4	3.4	2.2

Calculate the coefficients, coefficient of determination r^2, and the standard error $s_{y/x}$. Provide the details of your calculations and the relations you use to obtain the coefficients. In the end, only when you want to solve the system of equations to obtain the coefficients, instead of solving it by hand, you may use MATLAB and only provide the final answer. Write you final answers in the designated areas in the answer sheet. Also, use the provided table in the answer sheet to organize your calculations. In all of your calculations retain 4 digits after the decimal point.